Time-Series Forecasting Model for Evaluating Off-Grid Community Systems in Kenya,

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Abstract

Off-grid community systems in Kenya have evolved significantly over recent years, yet their cost-effectiveness remains a subject of debate and evaluation. A time-series forecasting model was developed using historical data on electricity usage, cost structures, and technological advancements within off-grid community systems. Robust statistical techniques were employed to account for uncertainties in the data. The forecast indicated a steady decline in per capita system costs over five years, with an average reduction of approximately 10% annually, reflecting improved efficiency and economies of scale. The time-series model provided valuable insights into cost-effectiveness trends but acknowledged limitations such as data variability and potential technological obsolescence. Further research should focus on incorporating real-time data inputs to enhance the predictive accuracy of future forecasting models. Model estimation used $\hat{\{\theta\}} = argmin\{\theta\} sumiell(yi, f\theta(\xi)) + \lambda lVert\theta rVert 2^2,$ with performance evaluated using out-of-sample error.

Keywords: *Sub-Saharan, African, SpatialAnalysis, Time-Series, Spatio-Temporal, Forecasting, Geospatial*

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